Internal Letter

Rockwell International

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No.

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SUBJECT: 881 HILLSIDE SOIL ANALYSIS

As a result of our meeting on September 8, we have written the following clarification concerning the results of our isotopic analysis of soil obtained from the 881 hillside. Many of the samples contained total activities well in excess of our normal working levels. In order to obtain a sample that was in the calibrated range of our methods, a very small sample had to be taken. In other words, where we would normally analyze a 2.5 gram sample of soil, we were forced to measure isotopics on a sample as small as 0.0025 grams. Measurement uncertainties on a sample this small are compounded compared to a larger sample.

The analyses of the samples in question indicate that the activity is due to depleted uranium which is the product of the enrichment process whereby U-235 and U-234 are removed from the bulk of the uranium. Therefore, the activity in depleted uranium is almost solely due to U-238 with very little contribution from U-234 or U-235. This was evident from the alpha spectra by the fact that a significant amount of U-238 activity was found and little or no U-234 activity was measured. If the activity had been due to natural or enriched uranium, the U-234 activity would equal or exceed the activity from U-238.

When analyzing a sample containing depleted uranium, the aliquot size must be chosen such that the prepared source will contain a small enough quantity of U-238 so as not to degrade the alpha spectrum. The analysis of these samples required very small aliquots (0.0025 to 0.0063 g) in order to meet this criteria.

Since such a small aliquot (containing virtually no U-234) had to be analyzed, the measurement uncertainty of the U-234 would be expected to be much larger than that observed in the analysis of samples containing natural uranium. Compounding the problem is the uncertainty of the reagent blank activity which must also be included in the overall measurement uncertainty. The reagent blank error is determined by statistically evaluating multiple reagent blank measurements. When this uncertainty is applied to such a small aliquot, the measurement uncertainty on a per gram basis is substantially larger than that of analyses performed on larger aliquots.

The minimum detectable activity (MDA) is partially based on the uncertainty of reagent blank activity. When this value is used for very small samples, the theoretical MDA will be quite large. The uncertainty and MDA of U-234 measured in depleted uranium can be improved by the use of a technique like mass spectroscopy where the interference from U-238 in the measurement of U-234 will be sharply reduced.

Another point mentioned in the meeting was that the dose assessment was going to be based on total uranium. If the dose is calculated assuming that the uranium is natural uranium, it will be substantially overstated due to the absence of U-234, since U-234 contributes as much activity as the U-238 per gram of natural uranium.

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